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Blue Ridge Rail Road Co.
Report, 1853/54

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ANNUAL REPORT

OF THE

PRESIDENT AND CHIEF ENGINEER

TO THE

STOCKHOLDERS

OF THE

BLUE RIDGE RAIL ROAD COMPANY,

AT THE ANNUAL MEETING,

HELD IN CHARLESTON, JULY 11, 1854;

TOGETHER WITH THE

REPORT OF B. H. LATROBE, Esq.

CHIEF ENGINEER BALTIMORE AND OHIO RAIL ROAD,

OF HIS

Examination of the Route of the Blue Ridge Rail Road.

CHARLESTON:
WALKER & EVANS, STATIONERS AND PRINTERS, 101 EAST BAY.

1854.

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Charleston, July 12, 1854.

The annual meeting of the Stockholders of the Blue Ridge Rail Road Company, in South Carolina, was held this day, at the Bank of Charleston.

A majority of the stock being represented, his Honor, T. L. Hutchinson, Mayor of Charleston, was requested to take the Chair, and T. M. Wagner appointed to act as Secretary.

The President then submitted his annual report; and, also, the report of the Treasurer. Also, Mr. Lythgoe's letter to the Board, asking a revision of his surveys and estimates. Also, the President's letter to B. H. Latrobe, Esq., Chief Engineer of the Baltimore and Ohio Rail Road, on the same subject, and the report of Mr. Latrobe, on his examination; and, also, the annual report of Mr. Lythgoe, Chief Engineer. All of which were received, and ordered to be printed in pamphlet form, for the use of the Company.

On motion of Mr. Bowie, the Stockholders then proceeded to an election of nine Directors, to serve the ensuing year.

Messrs. Bowie and Gilliland were appointed a Committee to hold the election, who reported the following gentlemen unanimously elected:

1. Henry Gourdin,
2. Hon. T. L. Hutchinson,
3. H. W. Conner,
4. G. A. Trenholm,
5. W. C. Dukes,
6. C. T. Lowndes,
7. T. L. Wragg,
8. Robert Adger,
9. C. M. Furman.

On motion of Mr. Bowie, the meeting then adjourned.

(Signed,) T. L. HUTCHINSON, *Chairman.*

Thomas M. Wagner, *Secretary.*

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West Union, January 10, 1854.

To the President and Board of Directors of the Blue Ridge Rail Road Company in South Carolina:

Gentlemen: Having completed the final locations of the road, from Anderson Court House to the North Carolina line, and having revised my estimates of the cost, I am convinced that the best line that could be obtained has been adopted. Deeply impressed, however, with the importance of the road to the State, and to Charleston, and with a view to a stronger and more general confidence in the enterprise, as well, also, for my own satisfaction, I would suggest, and request that my survey and estimates shall be submitted to the revision of some Engineer of established experience and reputation, who shall visit the line of road and examine the same.

I am aware that this cannot be done without incurring some additional expense, but it will, I am sure, be money well laid out, and to me, a source of great satisfaction.

I am, &c., &c.,

G. B. LYTHGOE,
Engineer-in-Chief Blue Ridge Rail Road.

CHARLESTON, APRIL 6TH, 1854.

H. B. LATROBE, ESQ., *Mills House:*

DEAR SIR: Referring to our conversation of yesterday, in which you expressed the desire that I would state more definitely the wishes of our Board, in the examination and revision of the surveys and estimates which they propose to have made of the Blue Ridge Rail Road, I would repeat, in the first place, that you need not entertain any feeling of delicacy in the matter, towards Mr. Lythgoe, as the revision of his surveys and estimates was a suggestion and request of his own, and he will be prepared, therefore, to give you every information to enable you to arrive at a satisfactory and independent opinion.

You will examine the surveys and revise the estimates of the several routes that have been run, and say which is the best to be adopted, taking into view the length, grades, curves, and cost of each. × Also, should any route, other than those which have been surveyed, strike you in your examination of the country, as promising more favorably, or should you think that any portion of the road can be changed to advantage, please direct such surveys to be made as will enable you to form an opinion.

Further; you will understand that we desire to have from you, any suggestions calculated to improve and make perfect, the proposed road, and would wish your opinion, therefore, as to the propriety of adhering to the maximum grade that has been adopted, or whether it may not be advantageous to raise it, taking into view the character of the trade that will pass over it; and, in this connection, whether the tunnel can be dispensed with, to advantage, at the Stump House Mountain.

From the foregoing, you will perceive that we give you the widest scope. If the surveys and estimates, and the location and plans of our engineers are correct, we seek a confirmation of them. If they are wrong the sooner we know it the better.

× Is there not a [illegible] and estimate?

So that we wish from you a well considered and independent opinion, on the various subjects submitted to you.

The most difficult portions of the road being in this State are the and Georgia, we desire that your examination will commence at Anderson, and terminate at or near Clayton. If our surveys and estimates are right in relation to this section of the road, we may fairly assume that there can be no difficulty as to the remainder of the route.

I am, very-resp'y,
Your ob't serv't,
(Signed,) H. GOURDIN,
President Blue Ridge Rail Road.

REPORT.

The President and Directors of the Blue Ridge Rail Road Company, in South-Carolina, respectfully report, that soon after the subscription made by the Corporation of the City of Charleston to the Capital Stock of the Company, in July last, the preliminary contract entered into with Messrs. Anson, Bangs & Co. was executed, and it was agreed that the road was to be commenced on the 1st of November following, and entirely finished and equipped from Anderson to the Tennessee State line in three and a half years.

An agreement was also entered into with the Knoxville and Charleston Rail Road Company, which was made to depend on certain aid, to be obtained from the State of Tennessee, in which case the Knoxville and Charleston Rail Road was to be included in the contract with Messrs. Anson, Bangs & Co., and the time for the completion of the entire line from Anderson to Knoxville extended to four and a half years.

An agreement was made at the same time with the Tennessee River Rail Road Company, by which that Company was brought under the contract made with Messrs. Anson, Bangs & Co., and subsequently a similar agreement was made with the Pendleton Rail Road Company. In conformity with the contract, the work was commenced on the 1st day of November, but embarrassments incident to the commencement of all enterprises on so large a scale, rendered the operations at that time more preparatory than otherwise, and it was therefore agreed that the contract time for commencing the work should be extended to the 1st January.

In the session of the Legislature of 1852, the bill granting the charter, provided for the endorsement of the bonds of the

Company to the extent of $1,250,000, the State requiring as security a first lien upon the road. This form of aid, while it might answer well the ultimate wants of a Company, is calculated rather, when resorted to in the commencement of an enterprise, to cripple its resources and to impair its credit; for it is manifest that should further funds be needed to carry on or to complete the work, a resort to loans, based on second mortgages, could not be otherwise than attended with great embarrassment and ruinous sacrifices. It was deemed best, therefore, to postpone the use of the State endorsement, and at once to apply to the Legislature to remove the difficulties which the aid, as granted, imposed upon the Company, and to ask a direct subscription to the capital stock of the Company of $750,000. A bill was therefore introduced for that purpose, which passed the Senate, but failed in the House, as is already known to the Stockholders.

The resources of the Company remain the same, therefore, as they were at the date of the application referred to, so far as relates to this State, Georgia and North-Carolina, viz:

City subscription	$1,049,000
Individual and other subscriptions	151,000
State guarantee	1,250,000
Contractors in stock and bonds	3,000,000
Making	$5,450,000

And leaving a deficiency of $550,000, presuming that the roads in the three States will cost, as estimated, $6,000,000.

Monies, however, borrowed under the guarantee of the State, and for which a first lien has been given, cannot be regarded as capital. On the contrary, the payment of interest on such loans during the construction of the road, constitutes an additional charge upon the capital. And, as it seems to be a principle universally admitted and recognized, that one-half of the estimated cost of a road should be secured in subscriptions to the capital stock of the Company, to place it in a sound position, both as regards the cash capital and the credit founded thereon, the Directors recommend that measures be taken to bring the subject again before the Legislature in a manner best

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calculated to secure the aid of the State, in a form that will free the Company from all embarrassment, enable them to carry on the work with economy and energy; and as the wisest course to avoid difficulties and delays is always to meet firmly in the commencement the requirements of the case, they further recommend that the Legislature be petitioned to remove the existing lien, and to aid the Company at once by a subscription of $1,000,000 to its capital stock, and further, by its endorsement to the extent of $1,000,000 in lieu of the present sum of $1,250,000, taking as security for the endorsement a common mortgage with other bond holders. This is precisely the same application that was made to the Legislature originally, founded at the time on mature reflection, and which time has only tended to confirm, as the best measure both for the State and the Company, because it is the most efficient to enable the work to go on without hindrance, in which both are equally and deeply interested.

As relates to the construction of the Knoxville and Charleston Rail Road, the Legislature of that State has granted aid to the Company different in form, but to a much larger amount than was expected. The contract with that Company has consequently had to be modified. The State grants $10,000 per mile for iron, and $100,000 for each bridge that it may be necessary to construct; and it is supposed that under the construction of the act given to it by the Legislature, the amount of aid in the bonds of the State will be $1,000,000, which, with county subscriptions in Knox and Blount counties, will make up a sum of $1,200,000. This sum, with the bonds and stock to be taken by the contractors, and a subscription from the Blue Ridge Rail Road Company, in South-Carolina, will be ample to complete that portion of the line.

There are now 228 individual subscribers, nearly all of them in Charleston. They are generally for small amounts, as they, and the citizens generally, consider themselves represented in the subscription made by the Corporation. It is to be hoped, however, and it is expected, that in another year, when the pressure in the money market has been succeeded by easier times, that more liberal subscriptions will be obtained. In the meantime the sub-contractors along the line of the road are receiving a portion of their pay in stock, so that eventually a large amount of shares held by the contractors will pass into their hands, creating stockholders and removing the objection frequently urged to the fewness of individual stockholders.

The Pendleton subscribers number 91, and their instalments are now paid to the Treasurer of the Blue Ridge Rail Road Company in South Carolina.

The Treasurer's report is herewith submitted. It will be seen that there has been expended

For salaries of Engineers and camp expenses and instruments	$19,658 13
For printing, stationery, printing bonds, preparing mortgage, salary of Treasurer, &c.	3,242 57
For grading, &c.	80,074 58
For land in Anderson	1,600 00
For interest on loans	296 49
	$104,868 77

The work thus far has progressed but slowly. The contractors employed in the commencement white labor almost entirely, picked up in the mixed population of our Northern seaports. It was not found to answer, and most of the work now in progress has been sub-let to parties chiefly on the line of road; and most of them having taken contracts since the planting season, their hands have been taken off to harvest the crops of oats and wheat, occasioning recently some interruption to the work. The entire line through South Carolina, however, being sub-let except the tunnels, and a portion through Georgia, there will be a satisfactory force upon it so soon as the harvest is over. The grading and masonry of such portions as have been sub-let are to be finished at various periods of twelve and eighteen months, and the work, thus far, has been executed within the estimates of the engineer. The tunnels will soon be sub-let to parties experienced in such work; in the meantime, the approaches to it are in progress.

It will be seen by the Engineer's report that there are now 29 engineers in the employment of the Company, of whom 21 are receiving pay, amounting in the aggregate to $1,866 66 per month. Eight are young men, learners as yet, and receiving nothing.

The road in South Carolina, finally located, is fifty and a half miles in length. In Georgia it is finally located also, and will be seventeen and a half miles in length. Some thirty miles have been finally located also in North Carolina, from the Georgia State line beyond Franklin, and about thirty-four miles in Tennessee, from Knoxville Eastward. The portions located in these two States prove more easy, and will be less costly than was expected; but the most difficult portions of each, passing through the Smoky mountains, have not been reached. The entire line through will, however, be located in the next six weeks.

Soon after the adjournment of the Legislature, at the suggestion, and by the request of Mr. Lythgoe, Mr. Benj. H. Latrobe, the distinguished Engineer-in-Chief of the Baltimore and Ohio Rail Road, was invited to make an examination of the road that had been located from Anderson to the Locust stake, to revise the estimates, to make suggestions that he might think necessary, both as to changes of route and alterations of grade, and to report frankly the result to the Board of Directors. Mr. Latrobe was selected because of his high reputation, and his experience on the Baltimore and Ohio Rail Road, where there are grades of 116 feet to the mile, and some six or eight tunnels; and the examination was limited to the roads in South Carolina and Georgia, because in these States is comprised the most difficult and costly portions of the work; and it was thought that should Mr. Latrobe's examination be confirmatory of the surveys and estimates of our own Engineers, it would place their correctness, and the practicability of the route, beyond all controversy, and tend to inspire in the Legislature, and among the people of the State, a more universal confidence in the enterprise.

Mr. Lythgoe's letter to the Board, the President's to Mr. Latrobe, and Mr. Latrobe's very minute and very able report, are submitted, and the Board take pleasure in stating that, except a difference in views in relation to the dimensions of the tunnels, the report fully confirms the surveys and estimates of Mr. Lythgoe.

The Board also take pleasure in communicating another fact of the highest interest in connection with the Blue Ridge Rail Road. The Legislatures of Tennessee and Kentucky, in their late sessions, chartered companies to fill the gap between Knoxville and Lexington, Paris or Danville, from which points rail roads are already in the course of construction to Covington, opposite to Cincinnati, and to Louisville, leaving the parties interested to select the passage through the Cumberland mountains by Wheeler's Gap, Cumberland Gap, or by both, as they might deem best. The former route has been selected, founded on a survey recently made; a company has been organized, and with the aid furnished by the State of Tennessee, and liberal county subscriptions, the entire line has been put under contract. Thus, link by link, and one after another, have companies been organized which will open the great States bordering on the Ohio to the Atlantic seaboard. That which a combination of States failed to accomplish a few years since, the force of circumstances is about to achieve—an object long and ardently desired by our own and the people in the distant West, and for which our State and people were ready, not twenty years since, to incur a responsibility of $12,000,000. This great object can now be secured by a State responsibility of $2,000,000, with her finances in a better condition, with the population of the great States, Virginia, Ohio, Indiana, Illinois, Missouri, Kentucky, Tennessee, North Carolina, to be brought into more direct and immediate intercourse with her, increased from 5,662,472, in 1840, to 8,779,003 in 1850, and according to Andrews' report to 10,000,000 nearly, in 1852, with their resources better developed, and better known to us, and a connection with them no longer an experiment.

The Erie Canal was the first great channel opened to the great and fertile regions of the West. New York has now, in addition, the New York Central, and the Erie Rail Road; Boston, the Western Rail Road; Philadelphia, her Pennsylvania Rail Road, half finished; and Baltimore, her Baltimore and Ohio Rail Road; and the multiplication of these great highways to the West has in no way diminished the receipts. On the contrary, the receipts on the Erie Canal are larger than ever; on the New York Central Rail Road they have increased to $500,000 per month; the Erie Rail Road to near the same sum; the Pennsylvania, half finished, to $250,000 per month, and the Baltimore and Ohio to near $400,000 per month; and Boston, New York, Philadelphia and Baltimore, notwithstanding this rivalry, are advancing in population and wealth more rapidly than ever. Nor is this prosperity and growth confined to these cities. The States, of which they are commercial capitals, have increased also in a like proportion, their lands and all other real and personal property having greatly augmented in value. Costly, therefore, as these great enterprises have been; mismanaged as many of them have been, they have fully justified the wisdom of their projectors, and proven that a connection with the great West is no longer an experiment.

The State may, therefore, in the opinion of the Board, grant the required aid to the great enterprise in which we are engaged, without risk or hazard. Will she do so? In answer to this question the Directors cannot consent to believe otherwise than she will. His Excellency, Gov. Manning, with that sound forecast and practical wisdom, for which he is so greatly distinguished, in his message the last session, commended this road to the particular patronage of the Legislature. It has since lost nothing of its claims to an enlightened and liberal support—on the contrary, many of the objections then made, and which caused its defeat, have been removed. By the time the Legislature meets, the entire line will be located from Anderson to Knoxville; all doubts as to the accuracy of the surveys and estimates have been, or should be, dispelled—the work has been commenced, and will have made material progress, and the Legislature of Tennessee has granted an appropriation which insures the construction of that portion of the line. Opposition may still be made by those interested in proposed rival routes; but with charters obtained for the entire line through; with a subscription larger than any other company can command in its commencement; with a road actually in the course of construction, and which will, through its connection with the

Greenville and Columbia Rail Road, and the Wilmington and Manchester beyond, and through them, with all the other rail roads within our limits, distribute and diffuse its benefits through the very centre, and into every section of the State, and even to portions of North Carolina, it seems to the Directors, that to an enterprise so general and so important in its character, all local opposition should now cease, and they are, therefore, not without strong and encouraging hope, that such aid will be granted by the Legislature as will place the Company in a position to press forward their great work to a speedy and triumphant completion.

The Blue Ridge Rail Road has been erroneously regarded by many as exclusively a Charleston enterprise, gotten up by Charleston, and for her benefit alone. It has, however, been shown that every portion of our own State will participate largely in its beneficial influences. It may be added, that to limit our conceptions of this great enterprise to Charleston, or to South Carolina, is to take but a narrow view of its character and magnitude. There are few passes through the mountains which separate the Southern from the Western States; and State lines are feeble barriers to the wants and demands of an already large, active and swelling population. The Blue Ridge Rail Road, from its position, must be the shortest great trunk line between a portion of the great West and the larger portion of Georgia, Florida, and a portion of North Carolina. The Blue Ridge Rail Road must, therefore, be "nationally Southern" in its character; the great highway between the great States of the West, and the Southern Atlantic States' seaboard, and the Gulf of Mexico and Florida, to be beneficial alike to all of them. And this fact, so far from being an objection, commends it more strongly to the fostering care of the State, because independent of that feeling of amity which should ever exist between communities adjacent to each other, and having similar institutions, the wider the area of support, the less will be the risk and the hazard to the enterprise in its construction.

It has been said also, that unlike our Northern cities and States, Charleston and Savannah, and South Carolina and Georgia, have not the foreign trade or the population to sustain a work of so much cost, and that the rail road will pass through a thinly populated and poor country.

To establish a foreign trade, markets must first be opened for the sale of imports. A tithe only of the imports into our Northern cities is consumed by them, and in relation even to Charleston, three-fourths nearly of her sales of merchandize are made beyond the limits of the State. The Northern cities have scaled the mountains, and are multiplying their rail roads everywhere, opening new markets as essential to the maintenance of their foreign trade. As yet, Charleston and Savannah have hardly more than reached Chattanooga ; and yet, with the great West not yet reached, both Charleston and Savannah are increasing in population, and new life appears in their streets, after a long and palsied existence. And why may they not enter fairly into the lists with their Northern rivals? Why may they not have a foreign trade of their own? Why may they not bring to their own warehouses the products of the West, over their own rail roads, a few hundred miles in length, instead of drawing them, by circuitous channels, over highways not their own? They have all the advantages of position. They lie in the very track of the West India and South American trade, and their cotton-loaded vessels for Europe, require as ballast the heavier products of the West: Indian corn, wheat, copper ore, &c.; and as relates to distance, taking Cincinnati as the most unfavorable point of comparison, Cincinnati, by the Blue Ridge, will be 632 miles from Charleston, and Cincinnati, from New York, is 850 miles, over the shortest route; Philadelphia, 750; and Baltimore, about 700 miles; Baltimore will, however, soon be but within 580 miles of Cincinnati—but still Baltimore is 200 miles from the sea, and Philadelphia 100 miles. The comparison is still more in favor of Charleston, from all points West of Cincinnati. Thus, Louisville will be from Charleston 610 miles, while from all the Northern cities she will be further removed than Cincinnati. Geographically nearer, therefore, with a climate permitting transportation and travel at all seasons, and with rail roads of easier and lighter grades, Charleston, with the markets of the

West opened to her, may establish, in time, a large direct foreign import, as she already has a large export trade. Looking also to the country through which the Blue Ridge Rail Road will pass, there is nothing to discourage us. Pickens and Anderson, in our own State, contain a population of 38,379, and with facilities for manuring their lands, are susceptible of vast improvement. A population of some 18,000 to 20,000 in Georgia will be tributary to the road ; in North Carolina, 20,000, and East Tennessee, with vast agricultural and mineral wealth, hitherto shut out from all the advantages of a market, with a population of 200,000, will at once pour upon us the fruits of her labors. Already her copper mines are extensively worked, and at no distant day will furnish a large business to the road and to Charleston—a trade that would be almost entirely lost to us by a road across the Blue Ridge further East. Charleston, by the Blue Ridge Rail Road, will be 350 miles to the nearest, and 433 miles to the remotest of them, making her the nearest seaport.

A direct and more immediate connection with the Western States is equally important to our home trade, which, in the United States, is usually estimated at double the amount, in value, of the foreign. How vastly important is it, therefore, to the entire South, that their supplies of Western produce, of which they are always, and in years of scarcity very large consumers, should be brought to their own doors by the shorter route across the Blue Ridge, than by the way of New Orleans on the one side, or Baltimore, New York and Philadelphia, on the other, burthened with a longer rail road transportation than their own rail roads, and as many miles besides (and in most instances vastly more) of sea navigation.

The Directors desire to bring to the view of the Stockholders also, the vast advantages which the Blue Ridge Rail Road will possess over any other rail road that may be located East of it. In the first place, it is now well known that the great copper ore region in Tennessee commences in Polk, and extends Northeast to Green county. The Blue Ridge Rail Road will strike into the very centre of this region, making Charleston its very nearest market on the seaboard. And in the next place, a rail road is now being constructed from Chattanooga to Cleveland, and another from some point on the East Tennessee and Georgia Rail Road, to connect with the Blue Ridge Rail Road at or near the Chilhowa mountain. This connection will enable the Blue Ridge Rail Road to compete for the trade of North Alabama, Mississippi, and South Tennessee, centering at Chattanooga, as well as that which will descend from Nashville, and the Nashville and Chattanooga Rail Road. A rail road further East would be beyond the reach of this trade, and as it would not shorten the distance between Cincinnati and Louisville and the South Atlantic seaboard, the advantages in favor of the Blue Ridge Rail Road are conclusive. At the risk of being tedious, the Directors have deemed it their duty to place before the Stockholders, and through the Stockholders before the public, the true character and scope of the great enterprise in which they are embarked.

Enough, probably, has been said, but looking to the future, where shall the South, and where shall Charleston be placed, if we do not identify ourselves with the great and growing fortunes of the West? The Hon. Robert J. Walker, in his celebrated report to the Treasury, in 1847, states that "our population doubles once every twenty-three years, and our products quadruple in the same period."

Now, the population of the States which will be brought into more direct and immediate commercial intercourse with us by the Blue Ridge Rail Road, increased in population in the ten years ending 1850, near 49 per cent., and Alabama and Mississippi 30 per cent. and 62 per cent., respectively. The estimated population of the former States, in 1852, as already stated, was near 10,000,000, and the value of their real and personal property was estimated at a value of $2,377,392,369. The estimated population of Alabama and Mississippi, in 1852, was 1,529,830, and the value of their real and personal property, $502,871,008. Now, applying the fact stated by Mr. Walker to the already existing population and wealth of the States referred to, and in another twenty-three years their population will be 23,039,660, and the value of their real and personal property, which it may be assumed will maintain a relative value to their productions, will reach $11,521,000,000. Is it not evident, therefore, that the commerce of no State or City on the seaboard, North or South, can maintain its relative position without a direct and immediate intercourse with this vast section of our country; and that it is equally the duty, as it is the interest of each community, and more especially the commercial emporiums on the seaboard, in a laudable ambition to maintain their own commercial independence and equality, to appropriate and make tributary the trade of those great sections most adjacent to them? The Blue Ridge Rail Road will accomplish this for our State and its commercial capital. It will restore to us that trade which, by proximity and geographical position, should long since have been ours, and it may safely be added, at little hazard, for its magnitude and the advancing condition of the country, furnish the strongest guarantee against failure or loss. Can the State, in view of all the facts stated, refuse its aid? To pause, while others are advancing, is to widen the distance, already too great, between us and our more enterprising Northern rivals. Charleston, by her liberal subscription, has given assurance of her earnestness and deep interest in this great enterprise. And now it is for the Legislature to determine whether this great work, the necessity for which the living and the dead attest, originating in no private or public speculation, but founded on the broadest principles of public good, shall be permitted to struggle through a long and protracted period of doubt and anxious uncertainty, dispiriting and discouraging to our people, or whether, by timely and efficient aid, they will place it beyond the reach of casualty, ensure its rapid completion, and thus give new life to our commerce, expand the field of our industrial employments, and furnish scope within our own limits to the genius, the enterprise and the ambition of our people. That she will do so, the Directors cannot permit themselves to entertain a doubt.

In behalf of the Board.

HENRY GOURDIN,
President of the Blue Ridge Rail Road Company,
In South Carolina.

Abstract of the Affairs of the Blue Ridge R. R. Company in South Carolina, July 1, 1854.

Dr.		Cr.	
Engineering Acc't.—For salaries of Engineers, purchase of instruments, camp expenses, &c.	$19,655 13	Capital Stock instalments paid in	$50,220 00
Expense Acc't.—For salary of Treasurer, printing, preparing mortgage, printing bonds, &c.	3,242 57	Do. do. full shares issued to A. Bangs & Co., as per contract, 1853	12,000 00
Grading Acc't.—For am't paid A. Bangs & Co., on sections Nos. 1, 2, 3 and 4, to June 1	80,074 58	Stock Acc't of A. Bangs & Co.	11 22
Land Acc't.—Paid for the purchase of two lots in Anderson C. H., for depot	1,600 00	Collateral Security from A. B. & Co., am't 10 per cent. on work done	8,007 44
Interest Acc't.—Paid interest on loans	296 49	Bond Acc't of A. Bangs & Co.	20,018 67
A. Bangs & Co.—For J. M. Eason & Bro's bill for Iron Pipes, ordered by Mr. Lythgoe	1,523 64	Blue Ridge R. R. Company	54,900 00
A. Bangs & Co.—For loan on pledge of stock	9,000 00	Pendleton R. R. Company	6,267 58
City 6 per cent. Bonds	35,000 00		
Cash on hand	1,032 50		
	$151,424 91		$151,424 91

THOMAS M. WAGNER,
Treas. B. R. R. R. Co. in So. Ca.

MR. LATROBE'S REPORT.

BALTIMORE, MAY 1, 1854.

H. GOURDIN, ESQ.,
President Blue Ridge Rail Road in South Carolina.

Sir: Having been invited by you to examine those parts of your line which presented such difficulties as appeared to call for a professional consultation, I have inspected the ground, together with the maps, profiles and estimates, exhibiting the location already made by your Engineers, from the Eastern terminus of your road at Anderson Court House, S. C., to the Rabun Gap in the Blue Ridge, in Rabun county, Georgia, at the head of the Little Tennessee river. This section of your route, beyond which its location is not yet extended, covers a distance of about sixty-two miles, and embraces the crossing of the mountain ranges, in the passage of which all the most serious difficulties of your work are to be found. The real obstacles are not, indeed, at the main summit separating the Atlantic and Mississippi waters at the "Rabun Gap," but are encountered in crossing the high and precipitous ridge flanking the Blue Ridge upon its Eastern side, and rising abruptly from the plain country at its base. This ridge, bearing the name of the "Stump House Mountain," consists of a flat-topped range of table land, elevated about 1700 feet above the sea, and 700 feet above the general level at its foot. Many spurs and outliers lie along its Eastern face, among which is a steep, narrow and knobby ridge called the "Turnip Top Mountain," united to it by a ligament or "saddle"—much lower than either mountain.

Your line, after traversing for 35 miles the rolling country from Anderson Court House, via Pendleton village, to the crossing of Cane creek, near the foot of the Turnip Top Mountain, commences to ascend this mountain with a uniform grade of 60 feet per mile, and after rising four or five miles along its Eastern slope, passes around one of its highest and broadest knobs, by a circuitous curve, which carries it entirely round to the Western slope, along which last it pursues its ascent, perforating, by a short tunnel, the saddle ridge already mentioned. The line then reaches and climbs along the Eastern slope of the Stump House Mountain for a couple of miles, penetrating a projecting spur by another very short tunnel, and soon after, arriving at the deep cleft made by one of the branches of Cane creek. Turning into this opening, and passing the "Falls" of the creek, which precipitate themselves for a hundred feet in height, over the rocky ledges laid bare by its torrent, the line crosses a deep cove or basin hollowed out by the several streams uniting to form the "Falls," and plunges into the body of the mountain by a tunnel, one mile in length, and about 235 feet below the highest ground on its summit. At the Western portal of this tunnel the line emerges upon the Village fork, a branch of the Chauga creek, a tributary of the Tugaloo river, the latter a branch of the Savannah. Crossing the Chauga at a low level, the route proceeds Western over an intervening ridge, dividing it from the "Village" fork of the same stream, and thence across another low divide to the waters of the Whetstone creek, which it follows to the Chatuga river, forming here the boundary between South Carolina and Georgia. This rapid and beautiful river is crossed by a viaduct of considerable elevation but of limited length, and from its Western bank the route passes up the direct and favorable valley of Dick's creek, to a high but narrow ridge, at its head which it pierces by a tunnel some two thousand feet in length, and enters the valley of the Warwoman creek, a tributary of the Chatuga, emptying into it a mile above Dick's creek. The line then ascends the valley of the Warwoman to the head of one of its branches, at the "Saddle" summit, lying between two lofty mountain peaks called the "Pinnacle," and the "Screamer;" crossing the Saddle by a short tunnel, the route follows a branch of the "Sticoa" creek, to near its confluence with the principal stream of that name, at the village of "Clayton," the seat of Rabun county, Georgia. Thence the line turns up the main Sticoa, and passing the "Falls" of that stream where it cuts through the Blue Ridge, enters the beautiful basin in the midst of the mountain, wherein lies the flat and almost imperceptible divide between the waters of the Savannah and Tennessee rivers. This summit, the culminating point of the route, is passed without excavation, and the line is carried onward down the "Little Tennessee," upon a grade conforming to the surface of the flats bordering that stream. My personal examination of the country terminated at this point, the difficulties of the located part of the route being passed, and the fine, smooth valley of the Tennessee lying ahead, to the Locust stake, at the boundary of Georgia and North Carolina, and thence across the latter State to the Tennessee boundary, at the pass of the "Smoky Mountains."

I have thus briefly described the route of your road as far as I have examined it, and the remarks I proceed to submit will relate—First, to its "location;" and, second, to the "estimated cost of its construction;" upon which two points you have asked my professional opinion.

THE LOCATION OF THE LINE.

The charters granted by the States of South Carolina and Georgia, in defining the route, mention but four points, viz:—Anderson Court House, Clayton, the Rabun Gap, and the Locust stake, on the line dividing Georgia from North Carolina. Between these points, therefore, the country is open to selection, and has been thoroughly examined by your indefatigable engineer corps. The country to be traversed consists, as already described, of the rolling region, with its hills and vallies, from Anderson to the foot of the mountains, and of the mountains themselves, with their ridges and defiles. The general course of the line, from Anderson to the Locust stake, six miles beyond the Rabun Gap, is about N. 50 W., and the air line distance 54 miles, while the length of the line as located will be 68 miles; showing an increase of 14 miles, or 26 per cent. This is not great, considering the character of the country, and affords evidence that proper attention has been paid to secure the shortest line compatible with moderate grades and curvatures.

The principal points of note in the route are: 1st, the village of Pendleton; 2d, the crossing of Cane Creek; 3d, the apex of the "Horse Shoe Bend," at the "Sourwoodfill," on the Turnip Top Mountain; 4th, the "Stump House Mountain Tunnel;" 5th, the "crossing of the Chatuga river," on the Georgia line; 6th, the "village of Clayton," at the forks of the Sticoa; 7th, the "Rabun Gap," in the Blue Ridge, the grand summit of the route; and 8th, and lastly, the "Locust stake," on the Georgia and North Carolina line, in the valley of the Little Tennessee river. All of these points, (leaving out the 8th of course,) excepting the 5th, 6th and 7th, fall upon the right hand, or Northeast of the air line, and the three excepted points upon the left, or Southwest of that line. The second and fourth points are very near the line.

The points enumerated lie at various distances from the air line, the most distant from it being the village of Pendleton, four and a half miles on the right, and that of Clayton, six and a quarter miles on the left of that line. The route has been made to pass through Pendleton, altogether in deference to the desire of its inhabitants, as a shorter and cheaper line could have been had some distance South of that village. The law of Georgia mentions Clayton, but the character of the ground forbids an immediate passage through the town, and its interests can be as well, or better promoted, by a location somewhat North of, yet in sight of it, by which the requirement of the charter can be complied with.

COMPARISON OF DIFFERENT LINES.

To speak now of each division in order, I observe, that I have placed the end of the first, or low country, division at the crossing of Cane creek, for the reason that there the ascent of the mountain properly begins, and the topographical character of the country entirely changes; yet, there are routes upon this division which must be noticed as alternatives to the located line, and do not fall into that line until they reach points upon the second, or mountain division.

The most important of these alternative lines is called the "Keowee" line. It departs from the located line at Pendleton, and pursues a more Northeasterly course in the direction of the "Sourwoodfill," at the point of the Horse Shoe Bend, on the Turnip Top Mountain. The Keowee line is two miles shorter than the adopted line by West Union, and has 52 feet less rise and fall. The limits of grades and curvature is the same on both lines. On the other hand, the Keowee line would be most costly to construct, according to the detailed estimates of your engineers, by $397,445, excluding the iron rails. If we include the latter item, and use a 75 lb. rail, as contemplated by your chief engineer, the Keowee line will be entitled to a credit of 236 tons of iron, which, at $75 per ton, would amount to $17,700, and reduce the difference to $379,745.

To bring it, then, to an equality with the West Union line, we should be obliged to estimate the economical value of each mile of measured distance saved at $189,872 ; a standard much too high. It has been somewhat customary among our engineers to rate distance (all other things being equal) at $10 per lineal foot, or $52,800 per mile. Tried by this rule, the question between these lines is quickly decided in favor of the West Union line ; but as the rule is empirical, and applicable only to certain conditions of trade, &c., it would not be safe to trust it where the balance of cost of construction was nearly equipoised. Here the difference is so great that we may feel secure in assuming that the distance saved is not worth the expense added, even if a liberal allowance is made for the 52 feet of diminished rise and fall on the Keowee line. This will be sufficiently manifest if we take the part of the cost of running a mile on the road strictly proportioned to length of track, at 50 cents. Then, as every train will travel two miles further on the West Union line, the daily addition to the cost of working that line would be $1 per train. Now, if we take from $379,740, the difference in the cost of the two lines, the very liberal sum of $20,000, for the saving of rise and fall on the

Keowee line, there will be left $349,745, on which the daily interest is $59.13-100, and it would therefore be necessary that 60 trains (30 each way) should pass over the road in the 24 hours, which would give a train every 24 minutes, over each mile of the road. It must be obvious that such a trade and travel, as would accompany such a frequency of transit, is not to be expected upon this line, or indeed, any other line, unless one engaged chiefly in the transportation of coal and other minerals.

The "Keowee" line being thus rejected on account of its excess of cost not counterbalanced by its shorter length, we next consider the "Steele's Mill" line in comparison with that of the location. These lines diverge 11¼ miles West of Pendleton, and the former crosses Cane creek at Steele's mill, three miles lower than the adopted line. It then ascends towards the mountain by the ridge, dividing the waters of Cane creek from those of Little river, and rejoins the located route at the toe of the Horse Shoe Bend.

The objections to this route are, its greater length, by one mile, and increased cost by $360,805; the latter chiefly due to the rougher ground generally occupied, and to the very expensive crossing of Cane creek, at a greater elevation and an unsuitable point. That it has been properly rejected there can, therefore, be no question.

A short alternative route, departing from the located line at West Union, and passing through the new and promising settlement of "Walhalla," on the same ridge, and one mile farther West, may be noticed; but as it involves a loss of one-quarter of a mile in distance, an increase (beyond the adopted limit) of the grade ascending Eastward, and of cost of construction by upwards of $40,000, it has been rightly rejected.

The only remaining line, connected with the first division, although lying in part upon the second, is that referred to by your chief engineer, on the 1st page of his report to you of the 7th of March last, as having been traced from the "Saddle Gap Ridge," uniting the Turnip Top and Stump House Mountain, to a point on the Keowee line, below the foot of the former mountain. A slight examination of the profile of this line satisfies us of its impracticability, on account of the absence of ground high enough for the grade.

The comparisons now made between the located line and its several alternatives, on the first division, result, therefore, in a decided preference of the route established by your chief engineer, and described in the earlier part of this report.

I now pass on to speak of the second, or mountain division of the line, extending from the crossing of Cane creek to the Rabun Gap, and thence to the Locust stake at the North Carolina boundary.

The located line has already been described as being developed upon the slopes of the Turnip Top and Stump House Mountains, sufficiently to secure distance enough for a grade of sixty feet per mile, and in effecting this but two considerable curves are encountered, the one at Horse Shoe Knob, and the other at the gorge of Cane creek falls. With these exceptions, the line is singularly free from curvature, considering the steep and furrowed slopes along which it lies. The Horse Shoe curve, of a radius of 955 feet, is, under the circumstances, a remarkably easy sweep around a ridge so sharp and precipitous; and the turn into the cove at Cane creek, at the mouth of the long tunnel, is upon a similar radius; which is the shortest used anywhere upon the line.

I make these remarks with special reference to the unfavorable impression which a view of the Horse Shoe curve, and the indirect parts of the line connected with it, may naturally make upon an observer. This feature of the line, ungraceful though it be, is, however, of no real importance. A certain height had to be overcome in a certain distance; and it matters little what particular shape the line assumes in order to gain that distance. The manœuvre by which the circuit of the mountain was executed has been skilfully performed, and is open to no substantial objection. I will refer to it again, at a suitable place, and will now speak of the alternative routes upon this, the second, or mountain division.

These routes were all traced with the view of avoiding the principal tunnel through the Stump House Mountain, by so extending the distance as to carry the road over the ridge by an open cut, or much shorter tunnel. It is not necessary to notice these lines in detail. The principal one, with a grade of 52 8-10 feet per mile, is particularly described in the report of your chief engineer, of November 20, 1852. It pursued the located route, although on a lower level, to Cane creek Falls, whence it followed the Southeastern flank of the mountain, winding around the numerous spurs jutting out therefrom, and crossing the deep, intervening ravines, including that of Coneros' creek, at its falls, until the "Black Pine Gap" in the crest of the mountain was reached. The summit, at this depression, being passed with a cut of some eighty feet in depth, the line immediately descended with the same grade to the Chauga creek, and crossing it at a high level, fell again into the located line, near the head of Whetstone creek.

Another line, of similar grade, but departing from the located route near West Union, was traced up the ridge between Cane and Coneros' creeks, and thence by the slopes and spurs, and around the knobs of the "Poor" and "Rich" mountains, outliers of the Stump House range, to and through the Black Pine Gap, to a junction with the first line at that point.

These lines were of about equal length and similar features. Their increase of distance over the located line would be five miles, with the grade of 52 8-10; and four miles, with the grade of 60 feet per mile, used on the location. The graduation on the longer lines, by the Black Pine Gap, avoiding the tunnel, must have cost at least as much as the shorter line, with the tunnel—besides which, the rise and fall of the longer lines would have been the greatest by upwards of three hundred feet, while their curves must have been of a radius as short as six hundred feet, or even less, and in the aggregate amount of curvature, much greater.

There would, then, have been nothing to compensate for the loss of distance, and hence these circuitous routes, so carefully explored and surveyed, with an anxious desire to save the long tunnel, resulted in an entire failure to improve the present excellent line. !!

There can, then, be no doubt that the passage of the moun-

+ through Rock or what?

tains is effected upon the very best line, including its extension Westward, as far as the head of the Whetstone creek.

From the last point, the line necessarily descends the Whetstone valley, and its right hand slopes, to the Chatuga river, which it crosses just below the mouth of Dicks' creek, where the banks are lofty and well suited to a viaduct of high level. The route then, as already described, passes up Dicks' creek, on its South slopes, to the head of one of its branches, where a high ridge is encountered, dividing it from the Warwoman—and this ridge it is necessary to penetrate by a tunnel of upwards of 2,000 feet in length, in order to reach the last named valley. The alternative to this route was one ascending the Chatuga to the Warwoman, and thence up that creek all the way. This line would have been three or four miles the longer, and lying upon ground extremely rough and costly, for two or three miles on either side of the Chatuga, would have been as expensive to grade as the tunnel route, and being considerably more curved, would have presented no advantages, and consequently no motive, for its adoption.

The line from the tunnel, at the head of Dicks' creek, to the Rabun Gap, and thence to the Locust stake, is so clearly defined by the natural features of ground, that no question arises in regard to it.

An alternative line, crossing the Chatuga at the narrows "below the mouth of Whetstone," was tried, but, although the site was favorable for a high bridge, the exit Westward from the river was impracticable. Finally, a route South of Dicks' creek was surveyed by the valley of the Licklog, and by a long tunnel through the high mountain range, immediately East of Clayton. This line resulted altogether unfavorably.

From the preceding observations upon the several lines offered by the country through which your route passes, it will be seen that I give a decided preference to the line located by your engineer corps, being thoroughly satisfied that it is the best.

It remains for me to speak of the manner in which the location has been executed upon this line, as respects grade and curvature.

THE GRADES.

In establishing a system of grades, we have to consider the features of the country as affecting the cost of construction, and the trade to be carried as influencing that of transportation; and the duty of the engineer is to decide how much capital he is to expend upon the bed of the road, in order to make the expenses of motive power a minimum. Has your engineer correctly decided this point in the present case, is now the question?

The limits of grade which he has adopted are forty-five feet per mile, ascending Eastward. How do these grades suit, first, the ground; second, the trade?

First.—The ground appears to be very well accommodated by these grades. The general rise of the country being to the Westward, the longer and steeper plains naturally ascend in that direction. The 45 and 60 feet grades seem to give, upon the parts of the route to which they severally apply, about the same cuttings and fillings, and may therefore be said to fit the ground equally well. Upon the first section of 14 miles, from Anderson to the Eighteen Mile creek, near Pendleton, the number of cubic yards per mile is about 46,000. On the second section of 14 miles, to near West Union, it is 93,000. On the third section, of 11 miles, embracing the part of the mountain grade East of the long tunnel, it is 100,000; and on the fourth section, of 11½ miles, including the tunnel, and extending to the Chatuga river, it is 103,000. These quantities are large, but not excessive, in view of the route in its several parts, the two last of which cover the leading difficulties of the whole line.

By steeper grades a reduction could doubtless be made in the capital invested in the road bed; but the expense of working the road would be increased. To examine this question, let us consider, first, the effect of steepening the 45 feet grade ascending Eastward. The trains carrying freight need alone be regarded in this estimate, and they will generally ascend this grade with full loads, the preponderance of tonnage being largely in this direction. Suppose we increase this grade to 52 8-10 feet per mile, and assume the locomotive to weigh 25 tons, its tender 15 tons, and each car itself 7 tons, and its load 8 tons (all of 2,000 pounds). The load of the engine would be reduced from 260 tons to 231 tons, including, or from 139 to 123 tons, excluding, the weight of the cars. This estimate supposes the engine to use the whole of its weight for adhesion, and that the adhesion averages 1-7th of the weight. It also takes the friction of the train (including the tender) at 10 pounds per ton of 2,000 pounds, including the resistance from the curves of the road. This increase of grade by 7 8-10 feet per mile would then diminish the load of the engine 29 tons gross, and 16 tons nett, or from a train of 17 cars to one of 15 cars. These two cars, taken from each train, would amount to 14 cars, or nearly a full additional train, whenever the freight moving Eastwardly reached seven trains per day, carrying about 1,000 tons daily, and 300,000 tons yearly—an amount of trade which may certainly be expected to pass in due time over this important line towards the seaboard, at the great commercial city of Charleston, destined, as she undoubtedly is, to enjoy a full share of the immense export production of the Mississippi valley.

If, then, the road be divided into stages of 100 miles in length, there would be required an additional engine upon each stage, to which the increased grade applied. This engine, with due allowance for its repairs and renewals, and the additional wear and tear of road it would occasion; for fuel, oil, wages, and its proportion of interest on spare engines, would cost $25 per day, and for the year of 300 days, $7,500, which, at 6 per cent., represents a capital of $125,000. That sum might then be spent upon the section of 100 miles, to reduce the grade from 52 8-10 to 45 feet per mile. From Anderson to the Locust stake is 68 miles, and extending this distance 32 miles down the Little Tennessee valley, we make up the 100 mile stage upon which the 45 feet grade will not occupy more than 20 miles, or 1-5th of the whole distance. Upon this twenty miles there could then be spent $125,000, or $6,250 per mile, to maintain the grade at that limit, rather than enlarge it to 52 8-10 feet. There would not be near so great a difference in the cost of the two grades, and hence the lower grade should be adhered to for planes ascending towards Charleston.

In the reverse direction, the grade of 60 feet per mile will stand as follows, in its relation to that of 45 feet. The freight trains, consisting of the engine, tender and 17 cars, as above described, will return Westward, up the 60 feet grade, but with a lighter freight. Assuming that the Westward bound tonnage will not exceed one-third of the Eastward, then the train would consist of 121 tons of cars, and 46 tons of freight, making a total of 167 tons. This train would be drawn by the engine up a grade of 76 7-10 feet per mile, with ease; equal to the traction of the train of 260 tons on the 45 feet grade, in the opposite direction. Why, then, it will be enquired, should not the grade Westward be increased from 60 to 76 7-10 feet? In his report of November 26, 1853, your chief engineer, while recommending the 60 feet grade, intimates that the relations of the grade "would warrant a much higher grade." We concur, then, upon this point, and I have only shown, in figures, what he had previously indicated in general terms. Nevertheless, I should hesitate to recommend an increase in this grade, for these reasons:

1st. It seems, in general, to suit the natural profile of the ground remarkably well, and it is doubtful whether much expense could be saved by a steeper grade. At the Horse Shoe Bend, indeed, that curve could be cut off, and some two miles in distance saved by adopting a grade of 96 feet per mile, but this would be 20 feet beyond the admissible limit. Consequently, the curve must be retained, and being so, the 60 feet suits it about as well as any other number. Again: At the head of Warwoman creek, in the passage of the Saddle ridge at that point; also, in the Eastern approach to the Rabun Gap, and at a few other detached places, some saving in cost of gradation might be made, but on the whole, the reduction of expense would not be very great. 2nd. The much greater length of the grades ascending Westward, qualifies, in practice, their relation to those ascending Eastward, and makes a margin necessary to be allowed in favor of the longer and heavier grade, and the difference of 16 feet is, perhaps, not more than is proper in this view. 3d. The passenger trains, which will be loaded about equally each way, should be favored as much as possible upon the Westward ascents. 4th. There will be times when the heavier freight will move Westward, and will then be helped by the lower grades.

A reduction of the grade in the long tunnel to 40 or 45 feet per mile, would have been well, had it suited other things; for the almost constant dampness of the rails in such tunnels diminishes the adhesion and effective power of the engines. It is also advisable to lighten grades in tunnels, in order to lessen the blast and combustion of fuel, and consequent evolution of smoke, affecting ventilation. The long tunnel, however, being straight, the traction within it will be less than on the curved parts of the way outside, upon the same grade, and the frequent shafts may, if properly availed of, be made to draw off the smoke, so as to prevent that annoyance from being intolerable.

Under all existing circumstances, then, and in view of the work already done upon the grade of 60 feet, and East of the tunnel, I recommend that it be retained.

In concluding my remarks upon the location of your route, I have only to express the hope that your engineers may be as successful in establishing the remainder of your line to Knoxville, as they have been in carrying it through the difficulties over which they have already so skilfully conducted it.

THE ESTIMATED COST OF CONSTRUCTION.

The questions that arise under this head relate, 1st, to quantities, and 2d, to prices.

First: Under the head of graduation, as the quantities of excavation and embankment, I have to say, that the cuttings and fillings exhibited by the profiles, are confirmatory of their sufficiency, and so, also, is a like comparison with the ascertained quantities of other lines of similar features, with which I am acquainted. The only item under this head about which I have been led to entertain a doubt, is the tunnelling. The total number of cubic yards, divided by the total length of the tunnels, (as set forth in the report of your chief engineer of November 26, 1853,) gives 8 cubic yards per linear foot, which gives a section of 236½ square feet; and for a width of 14 feet, a height of 17 feet, supposing the section to be rectangular.

If arched, in semicircular shape, the height of the crown would be 18 43-100 feet. These dimensions are, I think, contracted for the long tunnel, and I would advise that they be increased to 16 feet in width, and 20 feet 6 inches in height, at the crown of a semicircular arch. This would give a section of 300 square feet, or 63½ feet more than the present dimensions; an increase of 25 per cent. The short tunnels should also be at least 15 feet wide, and 19 feet high, with an arch-shaped roof.

Under the head of masonry, the quantities look rather limited, but upon the plans now generally adopted for piers and abutments, and which give the smallest contents consistent with stability, the number of perches may be sufficient.

The item of bridge superstructure is fixed by the width of the streams to be crossed, and gives, no doubt, the proper linear extent.

The material allowed for the railway track, exclusive of the rails and fastenings, appears sufficient for the plan contemplated, or for modifications of that plan if desired.

SECOND—AS TO THE PRICES.

These being now determined by your contract with Messrs. Bangs & Co., I need say no more of them than that I think them sufficient, with good management, to remunerate the contractors. The material of the cuttings, upon your line, so far as opened to examination, is easy. The earths are loose and loamy, and the rock mostly in so decomposed a state as to have become little more than a granular earth. It is chiefly granite, mica slate or gneiss, preserving its stratified structure and position, but generally so soft and friable as to be easier of removal than the clays of ordinary consistency.

In the classification of the material of the cuttings, your engineer will, of course, be governed by his own judgment. That which he has adopted in his report of February 20, 1852, promises to be sufficiently liberal to the contractor, so far as the composition of the excavations have disclosed. The only solid and hard rock reached, at the time of my visit to the work, was in the Eastern approach cut, and in the shafts of the long tunnel, where gneiss showed itself and promised a substantial roof for the drift. The contract price per cubic yard, for tunnelling, should be sufficient, if the rock should prove no harder than that already opened, and the water encountered be not very copious. The enlarged dimensions I have suggested for the tunnels would make the price very likely to be remunerative. It is, however, very difficult to predict, accurately, the cost of a subterranean work of such magnitude. By the time the shafts are sunk to the grade of the road, the quality of the rock will be well ascertained.

The contract price for *masonry* ought to suffice, if suitable quarries can be found near the crossings of the streams. There is doubt of this, for the first thirty or forty miles, beyond which good material for masonry appears abundant. Should the price, however, prove inadequate, it cannot much effect the general result of the estimates, as the quantity is not great.

The prices for materials and workmanship, under the head of *Bridge Superstructure*, are ample. The Chatuga river, (as your engineer proposes, and I recommend,) should be passed by two spans, of 200 feet each. The height above the river bed makes it more convenient to use long spans, few in number.

The contract prices for *Railway Superstructure*, are full, as far as specified, and the arrangement for the purchase of the iron is certainly a very liberal one to contractors.

GENERAL RESULTS OF THE ESTIMATES.

The preceding remarks upon quantities and prices, are intended to show my opinion of the data upon which the general estimates of cost are founded. The application of the contract prices to the quantities, is still to be made. This does not appear in any document submitted to me. I can, therefore, express no opinion more positive, than that a just application of those prices to the quantities given in your chief engineer's printed reports of November 20, 1852, and November 26, 1853, should afford a fair estimate of the cost of the work specified in those reports.

Referring, however, to your own printed report of December 12, 1853, and to those of your chief engineer, just named, from which the statements of estimated cost, in your own report, are chiefly derived, I am enabled to make up the following summary, which, for greater method and clearness, I have put into tabular form :

Exhibit of the Estimated Cost of the several Divisions of the Blue Ridge Rail Road, in the States of South Carolina, Georgia, and North Carolina, from Anderson to the Tennessee Line.

No. of Divisions	State in which Divisions lie	Beginning and end of each Division.	Length of Division, in miles	Grading, Masonry and Bridging.		Iron Rails and Fastenings.		Total Cost.	
				Per mile	Total	Per mile	Total	Per mile	Total
1	S. Carolina	Anderson to Chatuga	50½	39,230	1,981,119	8,000	404,000	47,230	2,385,110
2	Georgia	Chatuga to Loc. Stake	17½	39,230	686,525		140,000	47,230	826,525
3	N. Carolina	Loc. St. to Tenn. Line	74	19,123	1,396,000		592,900	27,123	1,988,000
		And'sn to Tenn. Line	142	28,617	4,063,535		1,136,000	36,617	5,199,635
Add for interest on loans during progress of work									$250,000
Add for equipment									500,000
									$5,949,635
To which may be added, to make an even number,									50,365
And we have the round sum of six millions of dollars									$6,000,000

Your contract with Messrs. Bangs & Co. gives you the option of paying this specific sum for the work, instead of paying for it by items, should you see fit to do so. In making up the preceding statement, I have taken up the several sums presented in your report, excepting that which refers to the cost of the division of 17½ miles through Georgia. This division, upon the line surveyed in 1852, was estimated by your chief engineer at $978,000, including the iron, and $866,000 without it—the latter covered the cost of graduation, masonry, bridging and railway, except iron, gave a cost per mile of $46,581, the length of the division being then estimated at 18 6-10 miles. Assuming that the improved location of the line will diminish its cost, I have supposed the cost per mile reduced to that of the South Carolina division, which is $39,230, within which it is not likely to fall.

The length of the whole route from Anderson to the Tennessee line, would thus appear to be one hundred and forty-two miles, and its estimated cost $36,617 per mile, or in the aggregate $5,199,635 for graduation, masonry, bridging and railway, and this amount, when increased by your additions for interest and equipment, and a small sum I have thrown in to make up even numbers, exhibits a total cost of $6,000,000, which gives an average of $42,253 per mile.

In judging of the sufficiency of such estimates, the safest course is to compare them with the actual cost of some other work that has been constructed upon ground of similar features and under parallel circumstances, for we thus include the many contingencies which invariably come in to swell estimates, however carefully made in detail before the commencement of a work.

That part of the Baltimore and Ohio Rail Road between Cumberland and Wheeling, completed within the last year, will afford a pretty fair standard of this sort.

Upon that road of 201 miles, the cost per mile of the several heads of construction will have been as follows, rejecting fractions:

Graduation	$20,000	per mile.
Masonry	3,500	“
Bridge superstructures	1,200	“
Railway track, excluding iron rails and fastenings	3,000	“
Total actual cost	$27,000	“

The iron rails, chains and spikes, at the low prices which then prevailed, cost, for a rail of 58½ pounds per yard, about $5,500 per mile. The $3,000 per mile of the other items of cost of track, included ballast, cross-ties, and workmanship of laying rails, but did not include the cost of adjusting the track for a year and more after it was first used, which appears in the printed statements of the Company, nor is the cost of sidings, which added about ten per cent. to that of the main track, embraced in the $8,500 per mile, which that is shown to have cost. If now we compare your estimates ($28,617 per mile) for the graduation, masonry, bridges and railway (in part), of the 142 miles from Anderson to the Tennessee line, with the actual cost of the same items on the 201 miles of the Baltimore and Ohio Rail Road from Cumberland to Wheeling, ($27,100 per mile,) over a very similar country, we find that the latter falls $918 per mile within the former.

This would seem to show that your estimate is a safe one, especially as the graduation of the Baltimore and Ohio Rail Road is for a double track, while that of your road is for a single track only. The amount of tunnelling, masonry, and bridge superstructure is greater on the Baltimore and Ohio Rail Road than on yours, in proportion to its length; but, on the other hand, the rock in the tunnels is less difficult than that likely to occur in your tunnels; and, on the whole, the cuttings and fillings (some peculiar cases excepted) are not so heavy as on the part of your line I have examined. The graduation of the Baltimore and Ohio Rail Road was also executed at a time of lower prices, and with unusual economy in all respects.

Upon due consideration, I cannot recommend any reduction in the amount of your estimates for graduation, masonry, bridging and railway. The eight thousand dollars per mile for iron rails and fastenings, will pay for the following materials:

4,000 lbs. of joint plates or chains, at 5c	$200
6,000 lbs. spikes, at 5c	300
100 tons of rails, at $75 per ton	7,500
	$8,000

This would give you a rail of but 63⅝ lbs. per yard. Your Chief Engineer has estimated for one of 75 lbs. per yard, which would, of course, be much better for you, if attainable.

There is, then, a reasonable assurance that your estimates will cover the cost of graduation, masonry, bridging, and the railway of the main track.

The item of $250,000 for interest on loans, would be sufficient, if the road were not more than three years in building.

The allowance of $500,000 for equipment is not so free from doubt. It may be sufficient to provide locomotives and cars enough to begin the business of the road upon the part here estimated for; but an immediate and rapid increase of the stock must take place, if the trade and travel turn out as great as you have a right to expect.

I do not observe any provision in your estimates for sidings or second track, nor for water stations, depot buildings, work shops, engine and car houses, right-of-way, engineering and general expenses.* The cost of these indispensable items must be met; but as your Chief Engineer will doubtless present estimates for them in due time, it is not necessary that I should notice them farther. I am not aware that there remains any thing for me to say in the performance of the duty I have undertaken as your Consulting Engineer, upon the points submitted to my advice, and which have now been fully treated of.

As, however, among the papers which came under my observation during my communications with you, was the contract between your Company and the Messrs. Bangs & Co., I would suggest that, in executing the more formal articles of agreement which it contemplates, suitable provision be made for the decision, as they arise, of all questions between the Rail Road Company and the contractors in regard to quantities and classifications of material, and character and value of work done under the contract. It is usual to make the estimates of the Company's Engineers final and conclusive upon all those points, experience having shown that, by that course alone can interminable disputes and endless litigation be prevented.

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*Note.—By reference to the report of G. B. Lythgoe, Chief Engineer, it will be seen that these items are embraced in the 10 per cent. allowed for contingencies.

In conclusion, sir, it gives me sincere pleasure to return my thanks for the courteous attentions which I received from yourself, from the Secretary of the Company, and from the Chief Engineer and his principal Assistants, during my visit to your line, and my brief but most agreeable sojourn in the city of Charleston. With cordial wishes for the rapid progress and complete success of your great work, I am, sir, with the highest respect, your obedient servant,

BENJ. H. LATROBE,
Civil Engineer.

MR. LYTHGOE'S REPORT.

Engineer's Office, Blue Ridge Rail Road,
West Union, *July* 9, 1854.

Henry Gourdin, Esq., President:

Sir: I have the honor to submit the following report of the progress of the Blue Ridge Rail Road, since the commencement of grading, in November last; and although the work has not progressed with that rapidity I had anticipated, yet a steady and uniform progression is carried on in this State. The work, with the exception of the tunnel, is all sub-let to responsible contractors, who are working small forces on nearly every two or three miles of road. These contractors have great difficulty at this time in obtaining a sufficient number of hands, which will probably not be the case after a short time, as they are now offering very high prices for laborers.

In Georgia, there has not been much done in grading, though I believe the principal part has been sub-let.

The whole road has been finally located, except some twenty miles in the vicinity of the Smoky Mountains; and we can now, in a great measure, arrive at the cost for grading. So far as I can yet ascertain, I have no reason to change my opinion in regard to my former estimate as to the cost or length of the road, except in one instance, which, in consequence of the Georgia charter compelling the road to be located the nearest practicable route by way of Clayton, makes the length of the road to the Locust stake—sixty-nine miles—against sixty-eight miles, as before reported.

The grading of the road has been finished in so many detached places, that it is almost impossible to ascertain the exact distance graded. We may fairly assume there has been in this

State something over five miles. The time allowed by the contractors to the sub-contractors I find generally to be until July, 1855. This is not in accordance with what I have understood was your wish. I, therefore, remonstrated with Messrs. Bangs & Co. against allowing to the sub-contractors so long a time to finish their work, but without effect.

The approach to the tunnel on the East end has been completed, and nearly one hundred feet of the heading taken out, thirty-three of which was accomplished the last month. The shafts, four in number, have not yet been sunk to a depth of over fifty feet, with the exception of one, which is now one hundred feet deep. All appearances go to show the whole tunnel will be of rock very suitable for tunnelling. My opinion is that the contractors will be able, after the two approaches and the four shafts are completed, to make in the headings some nine feet per day, and as the lower part can be taken out at the same time with proper arrangements, the tunnel could be completed in a little more than two years afterwards.

The estimated cost on final location in South Carolina, exclusive of iron and outfit, (engineering and turn-outs being included in 10 per cent. contingencies,) is as follows:

Earth excavation, 3,100,000 c. yards, at 25 cents	$775,000
Rock excavation, 344,927 c. yards, at 85 cents	293,200
Tunnelling, 7,200 feet, at $4.25	306,000
Embankment in excess, 600,000 c. yards, at 25 cts.	120,000
Masonry and bridging	160,000
Clearing and grubbing	11,440
Road construction	93,600
Contingencies, 10 per cent.	175,924
	$1,935,164

The estimated cost on final location in the State of Georgia, exclusive of iron and outfit, engineering and turn-outs included in contingencies:

Earth excavation, 1,060,060 c. yards, at 25 cents	$265,000
Rock excavation, 117,492 c. yards, at 85 cents	97,868
Tunnelling, 3,400 feet, at $5	170,000
Embankment in excess, 200,000 c. yds. at 20 cts.	40,000

Masonry and bridging	$120,000
Clearing and grubbing	3,960
Road construction	32,400
Contingencies, 10 per cent	72,922
	$802,150

The estimated cost on final location in the State of North Carolina, exclusive of iron, outfit, and the part not located, engineering and turn-outs included in contingencies:

Earth excavation, 1,520,640 c. yards, at 25 cents	$380,160
Rock excavation, 201,000 c. yards, at 85 cents	170,850
Embankment in excess, 200,000 c. yards, at 22½ cts.	45,000
Masonry and bridging	120,000
Clearing and grubbing	16,200
Road construction	133,200
Contingencies	86,541
	$951,951

The estimated cost on final location in the State of Tennessee, exclusive of iron, bridging, outfit, and the part of road not located, engineering and turn-outs included in contingent account:

Earth excavation, 891,256 c. yards, at 25 cents	$222,814
Rock excavation, 298,000 c. yards, at 85 cents	253,300
Embankment in excess, 400,000 c. yards, at 22½ cts.	100,000
Clearing and grubbing	11,880
Road construction	97,000
Contingencies, 10 per cent	68,409
	$753,493

Total amount in South Carolina	$1,935,164	
Total amount in Georgia	802,150	
Total amount in North Carolina	951,951	
Total amount in Tennessee	753,493	
		$4,442,758

The Engineer corps consists in one Chief, two division and four resident Engineers. Each division Engineer has a corps of five young men with him, who are now exploring and locating the road in North Carolina and Tennessee near the Smoky Mountain. This is the heaviest part of the work, say twenty miles distance, and the most difficult to locate to the greatest advantage; every mile will require the most scrutinous examination. On the Tennessee river, in the State of Tennessee, some ten miles below the North Carolina line, it will probably be found to be to the interest of the Company that the road should diverge from the river valley, running up a small creek to its head, and thence through a small dividing ridge, with a tunnel fifteen hundred feet long, crossing the river at this place, and running up the side of the river something over a mile before re-crossing, which will be the only bridging in the State of Tennessee on the Tennessee river, and by tunnelling and crossing the river at this point, two miles of road in distance will be saved.

We have been fortunate in obtaining so favorable a route, and that without crossing the Tennessee river in the State of Tennessee, except in two instances. Should it be proved, on further examination, that this route is not more favorable than the one following the valley of the river, with its windings and abrupt precipices projecting into the river, we shall not have to cross the Tennessee river in the State of Tennessee, nor can we do so to any advantage either in cost or shortening the road. In North Carolina we shall have to cross and re-cross the river frequently, and in some instances run along its bed. The crossing, however, will not be a matter of great moment, as the river becomes much narrower, and will require little more than the usual crossing of large creeks. That part not located, say twenty miles, will be expensive; I have not estimated it. Captain W. H. Griffin is now at the head of the party in North Carolina, and Mr. Walter Izard at the head of the one in Tennessee, both of which, I am pleased to say, consist of South Carolinians, and gentlemen whose duties have been skilfully and faithfully performed, without regard to their own convenience, and to whom much praise is due, for their earnest and untiring efforts to advance the interests of the Company.

Each resident engineer has charge of eighteen to twenty miles of road, more or less, as the case may require, with three young men under his charge. The duties of these young men are, to attend, daily, to each sub-contractor, and have the work carried on in a proper manner. They have generally been educated at institutions in this State, and bid fair to be an ornament to the State, and a credit to the institutions of which they are graduates. As the work on the road progresses, it will be necessary to increase the number of residencies, and the corps, when the work is in full operation, will consist of one chief, two division, ten resident, and thirty assistant engineers, making a total of forty-three.

Respectfully submitted,
By your obedient servant,
GEO. B. LYTHGOE,
Chief Engineer.

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